Textures

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ABSTRACT

Texture synthesis has been a recurring theme this year at SEP (Brown, 1999; Claerbout, 1998; Claerbout and Brown, 1999); here you can learn about the textures used by the authors. Some real data examples were shown in the aforementioned papers, but I show here only the synthetic, non-seismic textures. The real data can comes from Claerbout (1998), and is located at `/home/kana/book/gee/Data/`.

DIGITAL TEXTURES

Figures 1-11 are synthetic textures; adaptations of digital images. Some have been used as benchmarks in image processing papers (Heeger and Bergen, 1995; Simoncelli and Portilla, 1998). In fact, Mao and Brown obtained some of the textures (Figures 1, 2, 3, 4, 7, and 11) directly from Heeger, who teaches an image processing class at Stanford (http://www.stanford.edu/class/psych267/). Mao and Brown's final project for that class (Mao and Brown, 1998) used all of Heeger's textures, as well as Figures 5 and 6, which were generated by Brown. Figures 8 and 9 are "mask" functions, used to solve interpolation problems with missing data. A detailed theoretical discussion of missing data problems and the use of masks in general is (Claerbout, 1998), while a direct use of these masks is (Brown, 1999).

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BRICK WALL

Raw Data /home/kana/book/gee/Data/textures/brick.H
Velocity Model N/A
Stack N/A
Zero-offset Migration N/A
Usage (Claerbout, 1998; Claerbout and Brown, 1999; Brown, 1999; Mao and Brown, 1998; Heeger and Bergen, 1995; Simoncelli and Portilla, 1998)
Geometry

```
brick.H:
      in="stdin"
      expands to in="stdin"
      esize=4
      n1=128  n2=128  n3=1   n4=1                     16384 elem            65536 bytes
      d1=2    d2=2    d3=1   d4=1
      o1=5    o2=5    o3=0   o4=0
      label1=x
      label2=y
```
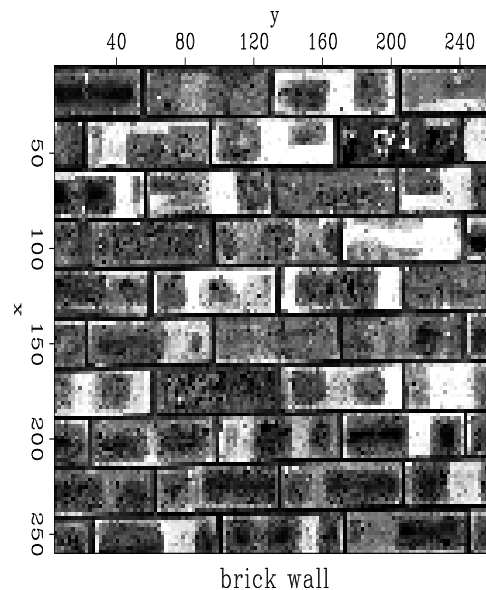
Problem N/A
History of Data Taken from Heeger as a TIF image, then converted to SEPLib format. This is a digitized, black and white photo of a brick wall.
Preprocessing N/A
Proprietary Considerations N/A

Figure 1: Brick Wall textures-brick
[ER]

brick wall

COARSE FABRIC

Raw Data /home/kana/book/gee/Data/textures/fabric.H
Velocity Model N/A
Stack N/A
Zero-offset Migration N/A
Usage (Claerbout, 1998; Claerbout and Brown, 1999; Brown, 1999; Mao and Brown, 1998; Heeger and Bergen, 1995; Simoncelli and Portilla, 1998)
Geometry

```
fabric.H:
     in="stdin"
     expands to in="stdin"
     esize=4
     n1=128  n2=128  n3=1                16384 elem           65536 bytes
     d1=1?   d2=1?   d3=1?
     o1=0?   o2=0?   o3=0?
     label1=x
     label2=y
```
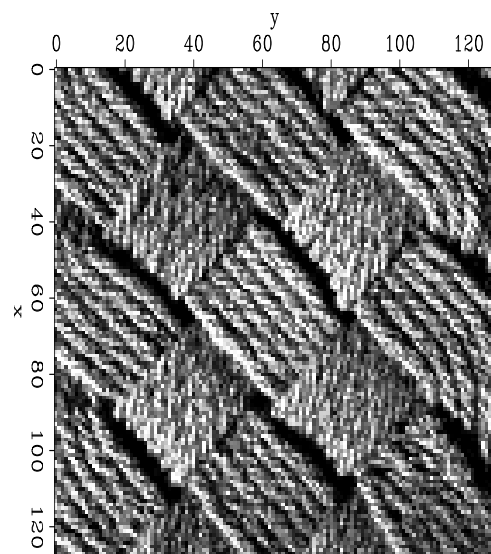
Problem N/A
History of Data Taken from Heeger as a TIF image, then converted to SEPLib format. This is a digitized, black and white photo of a coarse, unknown fabric.
Preprocessing N/A
Proprietary Considerations N/A

Figure 2: Coarse Fabric textures-fabric [ER]

GRANITE

Raw Data /home/kana/book/gee/Data/textures/granite.H
Velocity Model N/A
Stack N/A
Zero-offset Migration N/A
Usage (Claerbout, 1998; Claerbout and Brown, 1999; Mao and Brown, 1998; Heeger and Bergen, 1995; Simoncelli and Portilla, 1998)
Geometry

```
granite.H:
     in="stdin"
     expands to in="stdin"
     esize=4
     n1=128  n2=128  n3=1   n4=1                16384 elem          65536 bytes
     d1=2    d2=2    d3=1   d4=1
     o1=5    o2=5    o3=0   o4=0
     label1=x
     label2=y
```
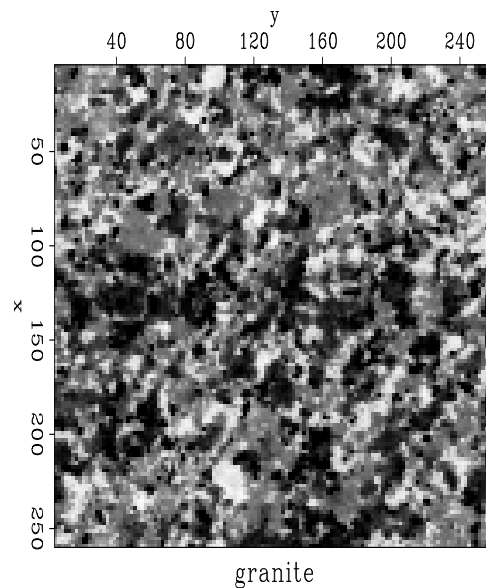
Problem N/A
History of Data Taken from Heeger as a TIF image, then converted to SEPLib format. This is a digitized, black and white photo of a piece of granite.
Preprocessing N/A
Proprietary Considerations N/A

Figure 3: Granite   textures-granite
[ER]

granite

HERRINGBONE FABRIC

Raw Data /home/kana/book/gee/Data/textures/herr.H
Velocity Model N/A
Stack N/A
Zero-offset Migration N/A
Usage (Claerbout, 1998; Claerbout and Brown, 1999; Brown, 1999; Mao and Brown, 1998; Heeger and Bergen, 1995; Simoncelli and Portilla, 1998)
Geometry

```
herr.H:
      in="stdin"
      expands to in="stdin"
      esize=4
      n1=128  n2=128  n3=1                16384 elem            65536 bytes
      d1=1?   d2=1?   d3=1?
      o1=0?   o2=0?   o3=0?
      label1=x
      label2=y
```
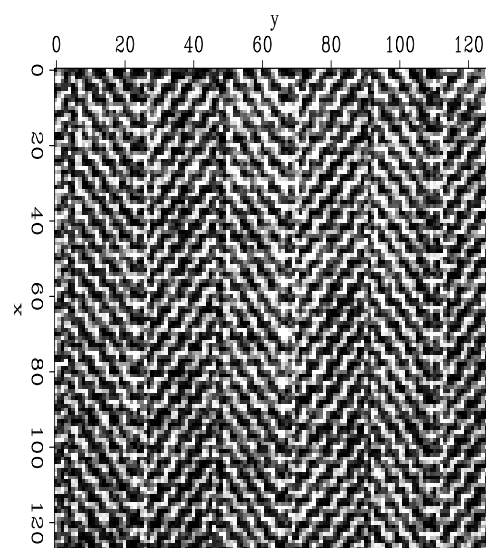
Problem N/A
History of Data Taken from Heeger as a TIF image, then converted to SEPLib format. This is a digitized, black and white photo of a "herringbone"-style fabric.
Preprocessing N/A
Proprietary Considerations N/A

Figure 4: Herringbone Fabric textures-herr [ER]

herringbone fabric

POLYGONS

Raw Data /home/kana/book/gee/Data/textures/polygons.H
Velocity Model N/A
Stack N/A
Zero-offset Migration N/A
Usage (**?**)
Geometry

```
polygons.H:
      in="stdin"
      expands to in="stdin"
      esize=4
      n1=128   n2=128   n3=1                16384 elem              65536 bytes
      d1=1?    d2=1?    d3=1?
      o1=0?    o2=0?    o3=0?
      label1=x
      label2=y
```
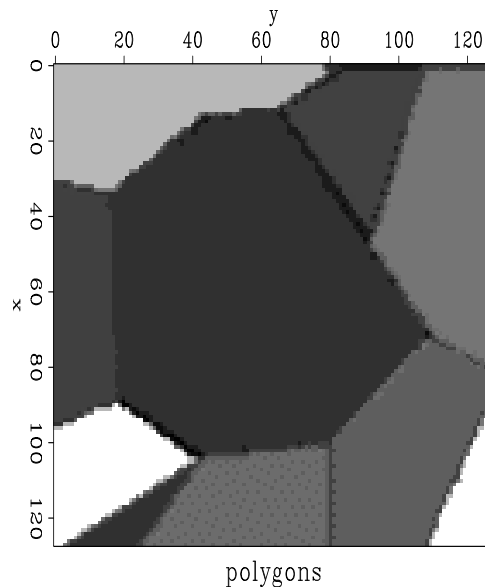
Problem N/A
History of Data Created by Brown using `xfig`, saved to TIF image, then converted to SEPLib
format. This is simply a randomly-tesselated polygonal region.
Preprocessing N/A
Proprietary Considerations N/A

Figure 5: Polygons
textures-polygons [ER]

RIDGES

Raw Data /home/kana/book/gee/Data/textures/ridges.H
Velocity Model N/A
Stack N/A
Zero-offset Migration N/A
Usage (Claerbout, 1998; Claerbout and Brown, 1999; Brown, 1999; Mao and Brown, 1998)
Geometry

```
ridges.H:
      in="stdin"
      expands to in="stdin"
      esize=4
      n1=128   n2=128   n3=1                    16384 elem                65536 bytes
      d1=1?    d2=1?    d3=1?
      o1=0?    o2=0?    o3=0?
      label1=x
      label2=y
```
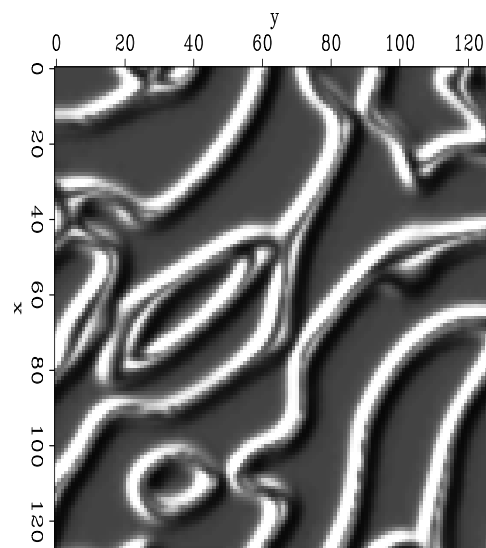
Problem N/A
History of Data Obtained by Brown from "GIMP" (Gnu Image Manipulation Program), freely available over the internet from `http://www.gnu.org` - the Free Software Foundation's homepage. GIMP offers many synthetic textures. Documentation available at `http://www.gimp.org`

Preprocessing N/A
Proprietary Considerations N/A

Figure 6: Ridges   textures-ridges [ER]

ridges

SEPELE BARK

Raw Data /home/kana/book/gee/Data/textures/sepele.H
Velocity Model N/A
Stack N/A
Zero-offset Migration N/A
Usage (Claerbout, 1998; Claerbout and Brown, 1999; Mao and Brown, 1998; Heeger and Bergen, 1995; Simoncelli and Portilla, 1998)
Geometry

```
sepele.H:
      in="stdin"
      expands to in="stdin"
      esize=4
      n1=128  n2=128  n3=1    n4=1                    16384 elem           65536 bytes
      d1=2    d2=2    d3=1    d4=1
      o1=5    o2=5    o3=0    o4=0
      label1=x
      label2=y
```
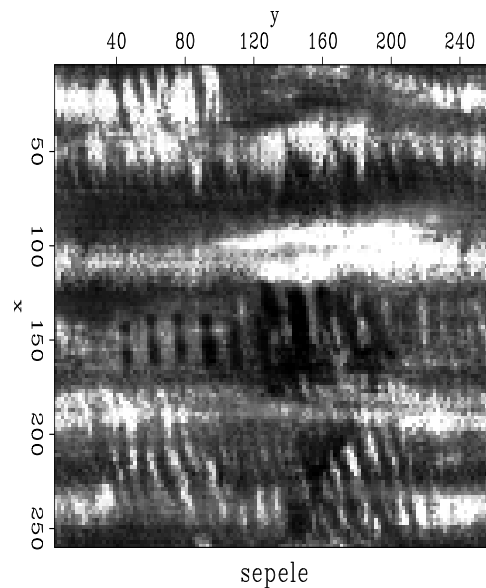
Problem N/A
History of Data Taken from Heeger as a TIF image, then converted to SEPLib format. This is a digitized, black and white photo of bark from a "sepele" tree.
Preprocessing N/A
Proprietary Considerations N/A

Figure 7:   Sepele   Bark
textures-sepele [ER]

SKULL MASK

Raw Data /home/kana/book/gee/Data/textures/skull.H
Velocity Model N/A
Stack N/A
Zero-offset Migration N/A
Usage N/A
Geometry

```
skull.H:
      in="stdin"
      expands to in="stdin"
      esize=4
      n1=128   n2=128   n3=1    n4=1                    16384 elem              65536 bytes
      d1=1     d2=1     d3=1    d4=1
      o1=0     o2=0     o3=0    o4=0
      label1=x
      label2=y
```
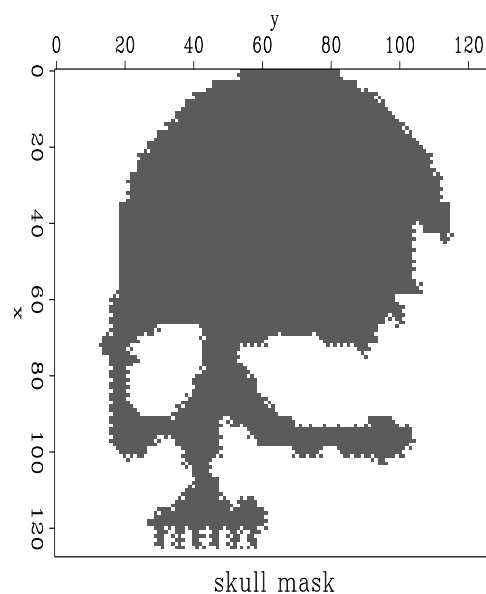
Problem N/A
History of Data Modified from a GIF image (`http://sepwww.stanford.edu/gifs/junk/skull.gif`), then converted to SEPLib format. This is simply a synthetic picture of a "skull", and is used primarily as a missing data "mask".
Preprocessing N/A
Proprietary Considerations N/A

Figure 8: Skull Mask textures-skull
[ER]

skull mask

STANFORD TREE MASK

Raw Data /home/kana/book/gee/Data/textures/stanford.tree.H
Velocity Model N/A
Stack N/A
Zero-offset Migration N/A
Usage (Claerbout, 1998; Brown, 1999)
Geometry

```
stanford.tree.H:
     in="stdin"
     expands to in="stdin"
     esize=4
     n1=128   n2=128   n3=1    n4=1                    16384 elem              65536 bytes
     d1=1     d2=1     d3=1    d4=1
     o1=0     o2=0     o3=0    o4=0
     label1=x
     label2=y
```

Problem N/A
History of Data Modified from a GIF image (`http://sepwww.stanford.edu/gifs/stanford.tree.gif`),
then converted to SEPLib format. This is simply a synthetic picture of a "redwood tree", and
is used primarily as a missing data "mask" as seen in (Brown, 1999).
Preprocessing N/A
Proprietary Considerations N/A

Figure 9:   Stanford   Tree   Mask
textures-stanford.tree [ER]

Stanford tree mask
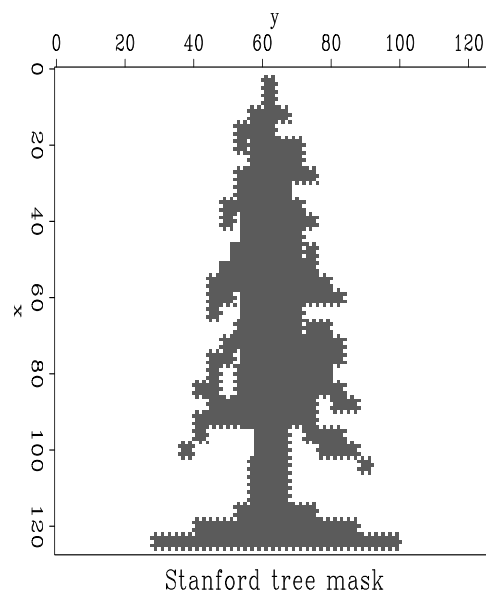
TWO FREQUENCIES

Raw Data /home/kana/book/gee/Data/textures/twofreq.H
Velocity Model N/A
Stack N/A
Zero-offset Migration N/A
Usage N/A
Geometry

```
twofreq.H:
      in="stdin"
      expands to in="stdin"
      esize=4
      n1=128   n2=128   n3=1                    16384 elem            65536 bytes
      d1=1?    d2=1?    d3=1?
      o1=0?    o2=0?    o3=0?
      label1=x
      label2=y
```

Problem N/A
History of Data Created in MATLAB by Brown, then converted to SEPLib format. This is simply the superposition of two 2-D sine waves, plus some additive random noise. Not used in any published work, but may offer some interesting possibilities in predictive filtering.
Preprocessing N/A
Proprietary Considerations N/A

Figure 10: Two Frequencies
textures-twofreq [ER]

two frequencies
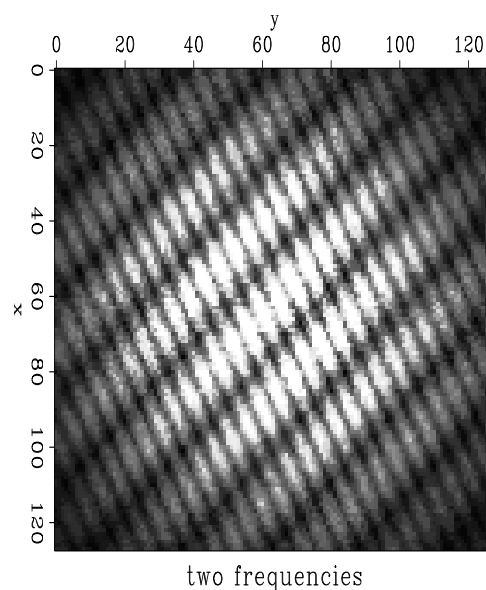
WOOD

Raw Data /home/kana/book/gee/Data/textures/wood.H
Velocity Model N/A
Stack N/A
Zero-offset Migration N/A
Usage (Claerbout, 1998; Claerbout and Brown, 1999; Brown, 1999; Mao and Brown, 1998; Heeger and Bergen, 1995; Simoncelli and Portilla, 1998)
Geometry

```
wood.H:
     in="stdin"
     expands to in="stdin"
     esize=4
     n1=128  n2=128  n3=1                16384 elem          65536 bytes
     d1=1?   d2=1?   d3=1?
     o1=0?   o2=0?   o3=0?
     label1=x
     label2=y
```
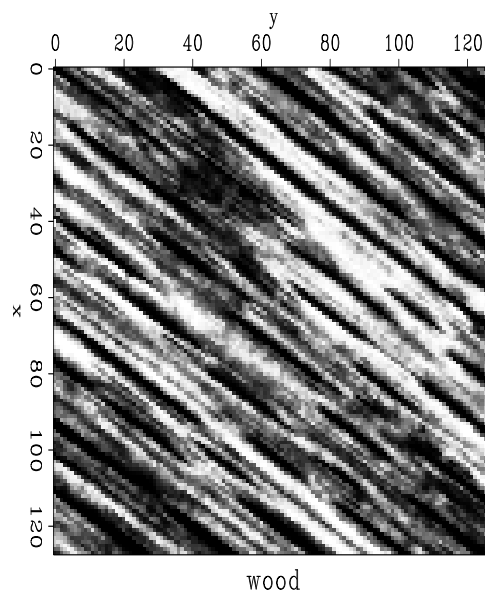
Problem N/A
History of Data Taken from Heeger as a TIF image, then converted to SEPLib format. This is a digitized, black and white photo of a weathered piece of wood.
Preprocessing N/A
Proprietary Considerations N/A

Figure 11: Wood   textures-wood
[ER]

wood

REFERENCES

Brown, M., 1999, Texture synthesis and prediction error filtering: SEP–**100**, 211–222.

Claerbout, J., and Brown, M., 1999, Two-dimensional textures and prediction-error filters: 61st Ann. Mtg., Eur. Assoc. Expl. Geophys.

Claerbout, J. Geophysical Estimation by Example: Environmental soundings image enhancement:. http://sepwww.stanford.edu/sep/prof/, 1998.

Heeger, D. J., and Bergen, J. R., 1995, Pyramid-based texture analysis/synthesis: Computer Graphics Proceedings, 229–238.

Mao, S., and Brown, M. Psych 267 final project - texture synthesis:. http://sepwww.stanford.edu/sep/morgan/texturematch/, 1998.

Simoncelli, E., and Portilla, J., 1998, Texture characterization via joint statistics of wavelet coefficient magnitudes: 5th IEEE Int'l Conf on Image Processing.